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ABSTRACT

For many Head Start teachers and staff, the word "science" conjures up uncomfortable feelings and memories. The purpose of this project--a collaborative effort of California State University, Long Beach and the Head Start Program of Long Beach Unified School District (LBUSD)--was to prepare Head Start staff to become more capable, comfortable, confident, and enthusiastic about their own and their Head Start families' "sense of wonder" about the world through hands-on science experiences. The training program components included a curriculum of over 100 science activities, summer institutes for Head Start teachers, follow-up "friendly visits" by project staff to provide ongoing support, and periodic follow-up meetings for field trips and sharing of experiences. The program was tested and refined with additional Head Start agencies in Los Angeles County and in Syracuse, New York. Evaluation activities included baseline study of reactions to science tasks, assessment of training and classroom activities, teacher feedback, and documentation of classroom visits. Findings showed a marked improvement in the quality and quantity of science experiences children received. In LBUSD, where only 63 percent of teachers reported being "comfortable" to "very comfortable" with science before the program, 95 percent were so at mid-year. The percentage of teachers who reported doing science every day increased from 35 to 63 percent after training. Classroom observations confirmed the enhanced role of science in the classrooms, and increased use of facilitated learning strategies. By encouraging a "sense of wonder" among children, teachers seemed to lose their own fears of science. (KB)

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ABSTRACT: Head Start On Science Preliminary Findings

William C Ritz, Project Director and
Ruth Von Blum, Project Evaluator

Although Head Start has had a powerful impact on the nation's youngsters, most Head Start programs, regardless of their large-scale successes, have lacked a science component. Indeed, for too many Head Start teachers, teacher aides, and home visitors, the word "science" conjures up some very uncomfortable feelings and remembrances. This realization prompted William Ritz of the Department of Science Education at the California State University, Long Beach to join with the Head Start Program of Long Beach Unified School District (LBUSD) to create the "A Head Start on Science" project. Funded primarily through a grant from the US Department of Health and Human Services, the project prepares Head Start staff to become more capable, comfortable, confident, and enthusiastic about their own and their programs' families' "sense of wonder" about the world through hands-on science experiences.

The program has developed a rich curriculum of over 100 science activities and it conducts summer institutes for Head Start teachers, in which they participate in hands-on science activities and practice techniques of facilitated learning" (using open-ended questioning strategies, acknowledging children's responses,.etc.) Follow up "friendly visits" by project staff to the classrooms provide ongoing support, and periodic follow up meetings provide opportunities for field trips and the sharing of experiences. Each participant receives a Guide containing Head Start On Science activities, in addition to a small start-up set of science supplies in a tote bag. The program has been tested and refined with additional Head Start agencies both in Los Angeles County and in Syracuse, New York.

Evaluation activities have included baseline study of reactions to science tasks, assessment of training and classroom activities, review of teacher feedback, and documentation of classroom visits. Findings show a marked improvement in both the quality and quantity of science experiences the children receive. For example, in LBUSD, only 63% of the teachers reported being "comfortable" "very comfortable" with science before the program, while 95% were so at mid-year during the program. Likewise, the percentage of teachers who reported doing science every day rose from 35% to 63% after training, with 80% (as opposed to 51%) reporting doing science at least two to three times a week. Classroom observations bore out the enhanced role of science within the Head Start classrooms, and increased use of facilitated learning strategies by the teachers. One of the most important evaluation findings is that by encouraging a "sense of wonder" among children, the teachers seemed to lose their own fears of science.

Comments from Head Start teachers were uniformly extremely positive, and the following is a typical example: "I came here thinking that this was going to be another boring class with nothing but lectures, formats, and a lot of writing. Boy oh boy was I wrong. There was so much hands on. I did everything. It opened my sense of wonder. Thanks. Believe me, when I do back to my classroom my science area is going to be a lot bigger and I will teach it to my children in the same fun way all the facilitator leaders taught me."

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HEAD START ON SCIENCE PRELIMINARY FINDINGS

Poster Session at the Fourth National Head Start Research Conference
Washington, D.C. July 10, 1998

Ruth Von Blum (Project Evaluator)

William C. Ritz, California State University, Long Beach (Principal Investigator)

Although Head Start has had a powerful impact on the nation's youngsters, most Head Start programs, regardless of their large-scale successes, have lacked a science component. Indeed, for too many Head Start teachers, teacher aides, and home visitors, the word "science" conjures up some very uncomfortable feelings and remembrances. Science was the subject most dreaded in school. Science is a subject only for the elite. Science is something that is only done by bearded old men in white coats who smoke pipes and wear horn-rimmed glasses. Many readily admit that science makes them uncomfortable. Some notable exceptions notwithstanding, science engenders little or no enthusiasm among many Head Start teachers, who feel neither comfortable with nor competent in science. Consequently too many Head Start children become involved in few, if any, science experiences.

This realization prompted William Ritz, of the Department of Science Education at the California State University, Long Beach to join with the Head Start Program of LBUSD in creating the project, A Head Start on Science. Funded primarily by a grant from the Department of Health and Human Services, the project was designed to demonstrate an effective way to improve the Head Start teaching staff's comfort level with and competency in teaching science, and to increase the quantity and quality of science experiences of Head Start children.

The essential ingredients of A Head Start on Science are shown in Figure 1. During its first year, Head Start teachers from the Long Beach Head Start Program participated. The second year, added as participants were Head Start teachers from both the Los Angeles County Office of Education, and the Syracuse, New York Head Start Program. The Southern California programs were coordinated and directed through the Department of Science Education of California State University, Long Beach; the Syracuse program was coordinated through Syracuse University.

A HEAD START ON SCIENCE

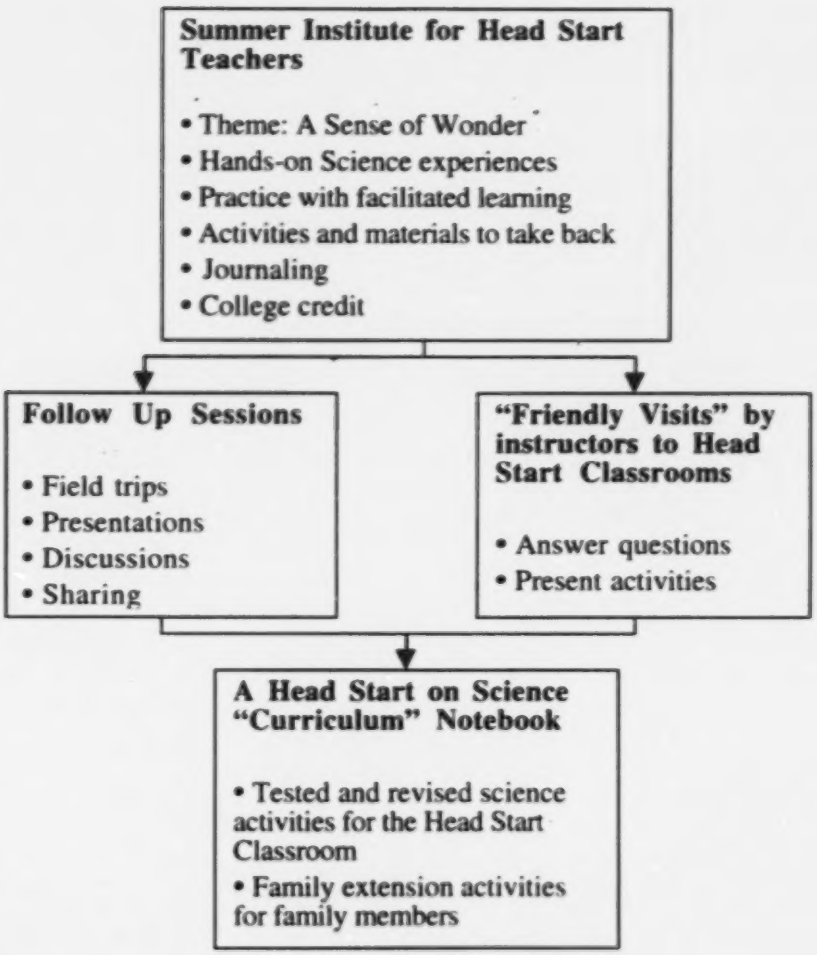
Summer Institute for Head Start Teachers
• Theme: A Sense of Wonder
• Hands-on Science experiences
• Practice with facilitated learning
• Activities and materials to take back
• Journaling
• College credit
Follow Up Sessions
• Field trips
• Presentations
• Discussions
• Sharing
"Friendly Visits" by instructors to Head Start Classrooms
• Answer questions
• Present activities
A Head Start on Science "Curriculum" Notebook
• Tested and revised science activities for the Head Start Classroom
• Family extension activities for family members

Figure 1 (Essential Components of A Head Start on Science)

The evaluation for A Head Start on Science consisted of collecting data about Head Start teachers' attitudes towards science, their confidence level in conducting science activities with their children, the degree to which they used appropriate questioning strategies with their children and encouraged children's observation skills, and the frequency with which they engaged in appropriate science activities in their classrooms. Data were collected from questionnaires, from observing Head Start teachers and children in classrooms, from careful reading of teachers' journals, and from interviews with Head Start teachers, supervisors, and administrators. Although the final analysis of the data has not yet been completed, the preliminary findings are worth sharing in summary with the larger Head Start community at this research conference.

The Long Beach Experience

At the urging of the Long Beach Head Start Program, the first A Head Start on Science Institute was expanded from the proposed 30 participants to a total of 97, and employed a "trainer of trainers" model. Twenty seven Head Start lead teachers received intensive training during the first five days of the Institute (Friday through Thursday, August 16-22, 1998), and then served as "facilitators" for the larger group of teachers and teachers' aids which met during its final four days (August 26-29,1998). The training staff consisted of the Project Director, eight leaders (all with extensive experience in either elementary science or early childhood education), one science consultant, and the Head Start Project Coordinator.

To provide baseline information on teacher practice, the evaluator visited selected Head Start classrooms with an "activity box" (containing either snails—with water, eye droppers, magnifying glasses, and leaves, or magnets—with a collection of metallic and non-metallic objects), and videotaped the interaction among the teacher, the children, and the materials. The idea was to look for the questioning strategies that the teachers use and the ways in which they encourage children to observe, investigate and explore, building their own understandings of science. These observations, along with interviews and questionnaire responses, revealed that many Long Beach Head Start teachers were weak in both their confidence about science and their abilities to engage children in meaningful science experiences.

Daily observations of the summer Institute, in-depth discussions with staff and participants, written comments from leaders and participants, and reflections by leaders on the phone and at the first follow-up meeting clearly indicated that participation in the

summer Institute had a tremendous impact on these teachers. The tone of ALL of the Participant's responses was overwhelmingly positive. The following comments, taken from the teachers' journals, are typical:

> "Definitely the best hands-on workshop that I have attended since I began working with the LBUSD."
>
> "This has been the most information that was really useful in the classroom."
>
> "This was the greatest learning experience I ever had. I can take it to the children."

The Institute was especially effective involving the participants in doing science through hands-on activities, and introducing them to questioning strategies. One of the most obvious results was that the teachers (especially the facilitators) displayed a new confidence in their own ability to involve their Head Start children in science. The major Institute theme, "Encouraging a Sense of Wonder," permeated the activities, and participants reflected their new appreciation for the nature of science and how to teach it, both explicitly in their conversations and writing, and implicitly through their often unbounded new enthusiasm for science:

> "I enjoyed having many preconceived notions regarding science dismissed, such as: science is boring, everything about science ends without an answer (everything just up in the air). Every day is filled with wonder, wow! What an appropriate theme for this training."

Although necessity mandated a two-stage training process, it became one of the strongest features of the Institute. We believe that the model worked so well here because:

- the hard work by the project staff prepared the facilitators with the self-confidence they needed to be effective;
- the second week gave the facilitators a chance to try out their newly learned questioning and other process-oriented skills;
- the number of facilitators in each classroom was sufficient to support each other; and
- the Head Start lead teachers (who became facilitators during the second week) were already familiar with both the culture of Head Start and the teachers whom they facilitated.

Comments such as the following from the facilitators were typical:

> "I feel very comfortable knowing that on these two weeks I leaned how to facilitate others by sharing ideas and taking ideas from others."
>
> "At first I was uncomfortable, shy, hesitant and didn't have any idea of my job. But through the 5 days training from all the Cal State Facilitators, I felt comfortable and gave me ideas of how to be a good and effective facilitator."

Most of the activities were very well received. They were hands-on, interesting, and fun, used every-day objects and organisms, and modeled good science teaching strategies. The activities did a good job of getting the participants enthusiastic about science, and giving them confidence in their ability to introduce their children to science. Participants and leaders felt the activities that worked especially well fell into three categories:

- adult/child activities, where the same activity was approached both from adult and child learner perspectives;
- family extension activities, which provided techniques for involving parents and other care givers in the science activities; and
- activities that involved making materials, such as planting, collecting insects, water play, etc.

In addition to the sense of wonder theme and the two-stage training process and specific activities, leaders and participants pointed to other features of the Institute contributing to its success:

- the opening activities that worked well to make everyone relax and feel at ease;
- the knowledge, preparedness and flexibility of the leaders, their respect for their audience, and their sense of humor;
- the socialization and team building with co-workers (the Institute helped establish friendships among teachers from different centers which can become the basis of a strong support network);
- the daily feedback provided by participants on what they understood or where they needed assistance; the relaxed atmosphere, including such activities as the daily early morning donut and coffee "friendly time," and the pot luck, which helped create bonds between the leaders and participants;
- the practice of having leaders model processes, such as using questioning strategies or teaching to an adult vs. a child, before participants were asked to engage in the process themselves;
- the idea of teaming a science leader with one from early childhood, which helped balance the Institute; and
- the practice of keeping journals, which were helpful for participants to reflect on their day, and consolidate their understandings.

Overall, the evaluator believed that the most powerful effect of the Institute was changing teachers' attitudes towards science, which establishes the foundation for all subsequent change. The teachers were freed from their fears of teaching science (and their own ignorance of science content). The teachers summarized it best in their notebooks and answers to the questionnaire:

> "I have another, different point of view about science. [She says that she always liked science and included it every day in her class.] But for me sometimes I felt like I needed to know more how to get children excited and interested in science...Now I know that I only need to provide the materials and activities and let children discover by

themselves without "teaching." This will make my work easy and less stressful. Thank you."

"I came here thinking that this was going to be another boring class with nothing but lectures, formats, and a lot of writing. Boy oh boy was I wrong. There was so much hands on. I did everything. It opened my sense of wonder. Thanks. Believe me, when I do back to my classroom my science area is going to be a lot bigger and I will teach it to my children in the same fun way all the facilitator leaders taught me."

Following the Summer Workshop, the evaluator attended all Head Start in Science post-workshop activities; conducted site visits to Head Start centers; interviewed teachers and Head Start staff and; gathered data from teachers via questionnaires and from their journals. Each of these activities revealed that the teachers were more comfortable with science and that Head Start classrooms in Long Beach have improved both the quality and quantity of science experiences being offered to the children in the program.

At the vast majority of the sites observed after the Institute, science has obviously taken a much more prominent place in the classroom—science areas were filled with interesting hands-on materials, and displayed children's work, like "tornado jars," "hairy potatoes," seedlings in pots or in bags in the window. Many teachers did a fine job of facilitated science teaching, engaging the children using open-ended questioning strategies and encouraging them to explore on their own. Since teachers entered the program demonstrating a spectrum of different attitudes towards and experiences with science; however, as would be expected, progress was not uniform, with some sites showing much more evidence of science activity than others. The biggest difficulty faced by the teachers, even as they included much more science in their curriculum, seemed to be relinquishing the role of "information giver," and letting the children explore and discover for themselves. (This problem is not unique to Head Start teachers, but plagues science education K-16.)

Two definitive indicators of the project's success come from an analysis of the teacher's journals and the results of a mid-year survey, both collected at the end of the second follow-up meeting. Teachers were required to keep a journal of their Head Start activities, and reading them provided a rich source of data for the evaluator. Even though the journals did not come from a completely random sample of the teachers (only from those who attended the follow-up meeting and who passed in their journals at that time), it is significant that 37 teachers from 15 different sites reported doing at least 44 different kinds of science activities during the year.

The questionnaires collected in the middle of the year revealed the striking increase not only in the number of times per week that science is taught in the Head Start classrooms, but in the comfort levels of the Head Start teachers. (See Figures 2 and 3)

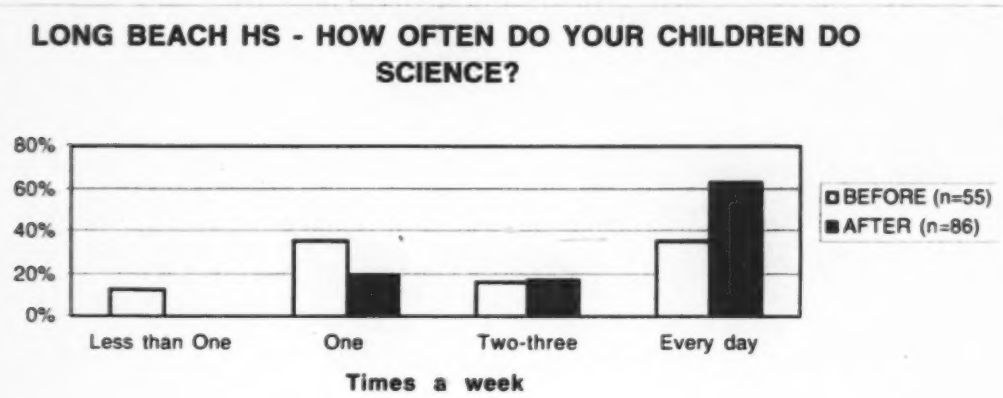

Figure 2

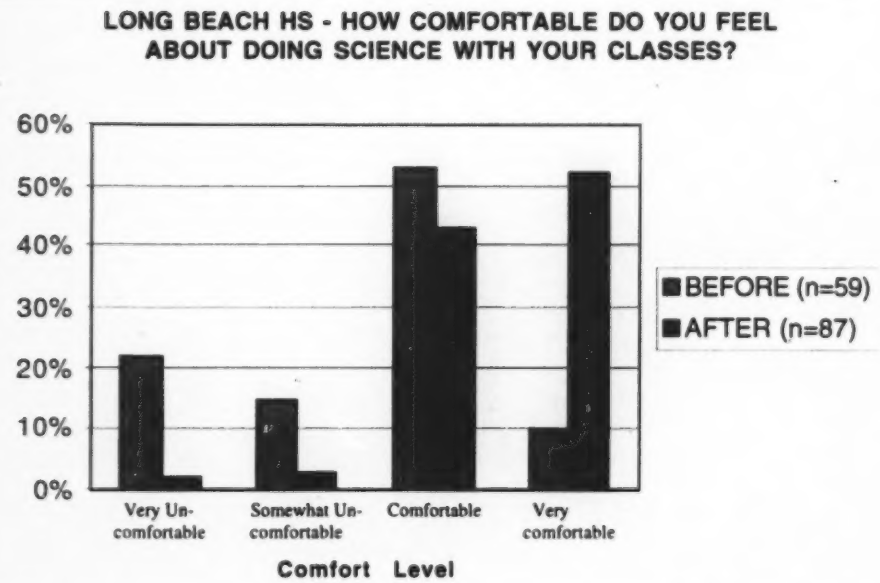

Figure 3

After a successful first year with Long Beach Head Start, A Head Start on Science was replicated in two new environments—the Los Angeles County Office of Education

(LACOE) Head Start programs (representing many different agencies), and the Head Start program in Syracuse New York. Two week-long LACOE Summer Institutes serving 44 teachers and 20 supervisors were held on August 11-15 and August 18-22, 1997 at California State University, Long Beach. The Syracuse Institute, attended by 32 teachers (representing every Head Start center in Syracuse) and 4 supervisors was held August 18-22, 1997 at Syracuse University.

The LACOE Experience

The training staff for the LACOE Institute consisted of the Principal Investigator, four leaders (teachers with extensive backgrounds in science who had been leaders in last year's workshop), five Head Start teachers (who had been facilitators during last summer's workshop and who were willing and able to take leadership roles), and the Head Start on Science Coordinator. The LACOE Head Start on Science Institute, like its Long Beach predecessor, involved participants in doing hands-on science activities and emphasized the strategies of "facilitated learning." Although some participants had expressed initial hesitation about interacting with others from different agencies, the staff made a point of recognizing and respecting the differences among participants, and several activities at the beginning of the week helped the groups of around 15-20 in each of the two rooms to "gel." An initial impression, confirmed by a Pre-Institute Survey, is that the participants were more comfortable with science and were better prepared than last year's group. This might be expected, since the teachers were more experienced, and the group was one third supervisory personnel. Nonetheless, participants were enthusiastic, and several said that although they had done some of the activities before, the Institute helped them see them in a new light.

The major Institute theme, "Encouraging a Sense of Wonder," once again permeated the Institute, and participants responded enthusiastically to most activities. When asked in the exit survey to indicate what that they had learned during the Institute, the most common response reflected a new vision of science. The following examples demonstrate the attitudes of the participants:

"When I think of science I usually think of learning something abstract and complex, after this week, I think of science in the following manner - play, interesting, fun, learning about the world around us, everything."

"When I first got here, I felt a bit 'iffy' about science, but now I am so calm and relaxed about making science part of my everyday curriculum."

Participants also indicated that they had gained a new appreciation for facilitated learning, again reflected in various comments:

"As a facilitator, I must provide not only the materials but the opportunity for children to explore with all their senses."

"I will remember to ask more questions and wait for a response. I learned to follow the children's lead and let them direct the activity as long as they are on task."

These were the major process objectives of the Institute. Even though the Institute spent a limited amount of time dealing with ways to share the experience with other LACOE Head Start teachers, several teachers mentioned in the survey that they looked forward to sharing what they had learned with others, and indeed did hold workshops and conducted other informal sharing with their peers during the year.

One of the features of the Institute that worked especially well was using a small group of facilitators from last year's workshop to help with the planning and conducting of the Institute. This helped to ground the planning in the experience of those who had attended the Institute last summer, and who had used the activities in their classrooms. The facilitators worked as partners with the Institute leaders, and took over the presentation of several of the activities. Thus they served as strong role models for the participants, modeling how teachers can share what they have learned with other Head Start teachers.

As in the previous year, most of the activities seemed to be very well received. They were hands-on, interesting and fun, used every-day objects and organisms, took advantage of the local outdoor environment, and modeled good science teaching strategies. They were effective in engaging the participants, holding their attention, and giving them confidence in their ability to introduce Head Start children to science. In addition using facilitators from last summer and specific activities, features that were successful last year were equally effective with the LACOE audience, including the sense of wonder theme; exciting opening activities; and knowledgeable, well-prepared and enthusiastic leaders who modeled the facilitation process.

Preliminary analysis of the questionnaires shows that, while the LACOE Head Start teachers did not show quite as striking a change in comfort level or in the number of times that they now include science in their classrooms (at least partly because they demonstrated a greater facility with science coming into the program), they nevertheless made substantial gains in both areas. (See Figures 5 and 6)

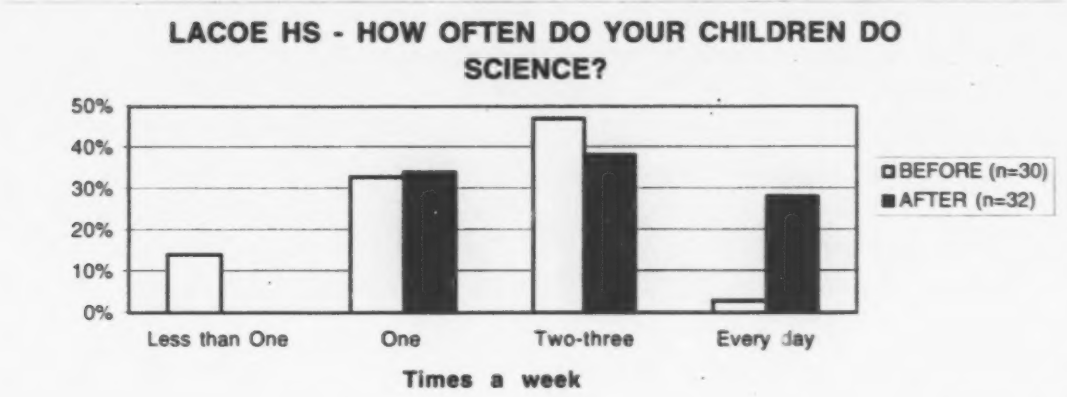

Figure 5

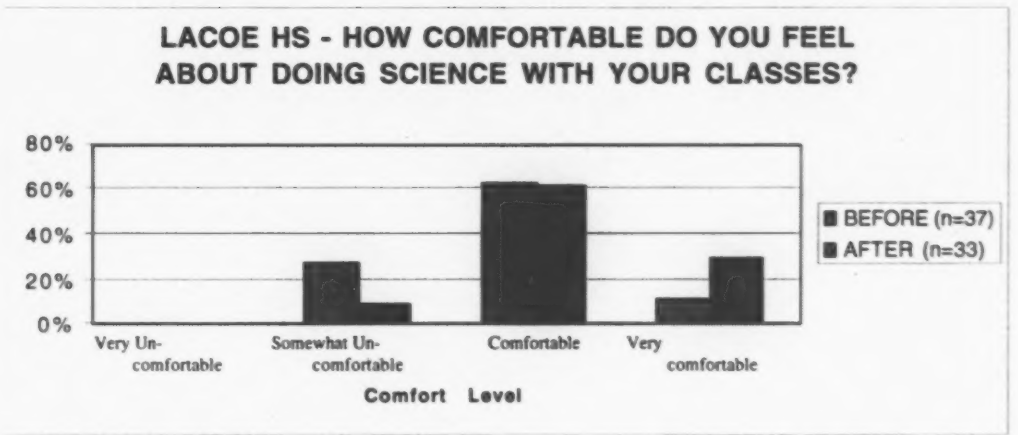

Figure 6

The Syracuse Experience

A Head Start on Science project also operated in Syracuse, New York during the second year of the project, to determine what elements are essential to successfully transplant the program to new soil. In preparation for the Syracuse Summer Institute, the two Institute leaders from Syracuse and the Syracuse Project Coordinator attended part of the first LACOE Summer Institute. In addition, one leader and one facilitator from that Institute briefed the Syracuse staff, and each was paired with a Syracuse leader for the Syracuse Institute proper. Two additional support staff in Syracuse helped with the many logistical

Institute proper. Two additional support staff in Syracuse helped with the many logistical complexities of conducting the Institute, and the Syracuse Director (Dr. Larry Shaefer from Syracuse University) worked closely with the Syracuse Head Start staff on overall planning and coordination.

The evaluation has revealed that the general approach taken in the A Head Start on Science project has also transferred well to this new environment. This success can be attributed to several factors:

- the very strong model established by the first Head Start on Science Summer Institute in Long Beach, with its emphasis on imparting to the teachers a "sense of wonder," as well as both the theory and practice of facilitated learning;
- the use of science activities which had been tested and proven during last year's Institute;
- the presence of a very strong and capable team of leaders at the Syracuse site, supported by a staff that handled the enormous logistical dimensions of the project effectively;
- the visit of the Syracuse teaching staff to the LACOE Institute;
- the assistance of an experienced leader and a Head Start teacher-facilitator from Long Beach who briefed the Syracuse staff and helped in the training, but who let the Syracuse leaders run their own show; and
- the use of detailed scripts describing each day's activities from which the leaders in the new program could work, and which they could modify as needed.

Participants' comments on the exit survey, mirroring those of the LACOE participants, were overwhelmingly positive; the most common expressed a new vision of science and a new appreciation for how it is integrated into everything:

[I got] "...a whole new outlook on science. I hated to plan for science in my classroom before this workshop. I never felt I was good at it or knew what I was doing. Now, I believe I am good at it and I can't wait to start implementing science in my room."

The comments also emphasized a new appreciation for facilitated learning and questioning, "allow the child to be a leader. Follow the child's questions with a question of your own."

Although final analysis of data from the LACOE and Syracuse sites has not yet been completed, preliminary findings indicate that the program has transferred well. It must be kept in mind, however, that at both sites not only were the model and materials from A Head Start in Science used, but many of the same instructors as well. Furthermore, two of the Syracuse instructors attended a week of the LACOE Institute. It is not clear yet how much support from instructors who have been involved in A Head Start in Science is necessary to successfully replicate the program.